Bank Avalanche Model of Systemic Risk

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Bank Avalanche

A bank avalanche occurs when more than one bank defaults at the same time.

Agent Based Model

Agents:

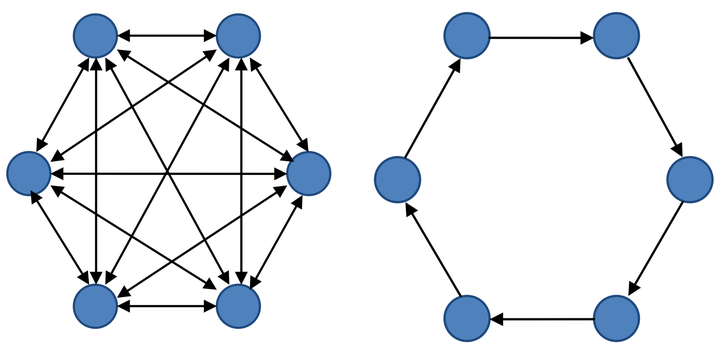
- Banks
- Non-Financial Transactors (NFTs)
- AIG-like Insurance Company

Definitions:

- Deposits: NFT asset given to bank.
- Loans: bank asset given to NFT.
- Euroloans: interbank loans.
- Eurodeposits: interbank deposits.
- Reserves: money kept at bank.

Bank Networks

Banks make loans and accept deposits from other banks depending on the network type.



Circle network: banks trade interbank deposits and loans with neighbors.

Complete network: all banks trade interbank deposits and loans.

Unconnected network: banks cannot trade interbank deposits and loans.

Star network: centrally cleared transactions of interbank deposits and loans.

References

[1] Daniel Friedman. "Bank Avalanche Model" Working Paper, *1998 and 2012*

[2] Diamond, Douglas W. and Philip Dybvig. "Bank Runs, Deposit Insurance, and Liquidity" Working Paper, *1983*

[3] Allen, Franklin and Douglas Gale. "Financial Contagion" Journal of Political Economy, *2000*

[4] Freixas, Xavier and Bruno Parigi, Jean-Charles Rochet. "Systemic Risk, Interbank Relations, and Liquidity Provision by the Central Bank" Journal of Money, Credit and Banking, *2000*

[5] Caballero, Ricardo and Alp Simsek. "Fire Sales in a Model of Complexity" NBER Working Paper, *2009*

[6] Gai, Prasanna and Andrew Haldane, Sujit Kapadia. "Complexity, concentration and contagion" Journal of Monetary Economics, *2011*

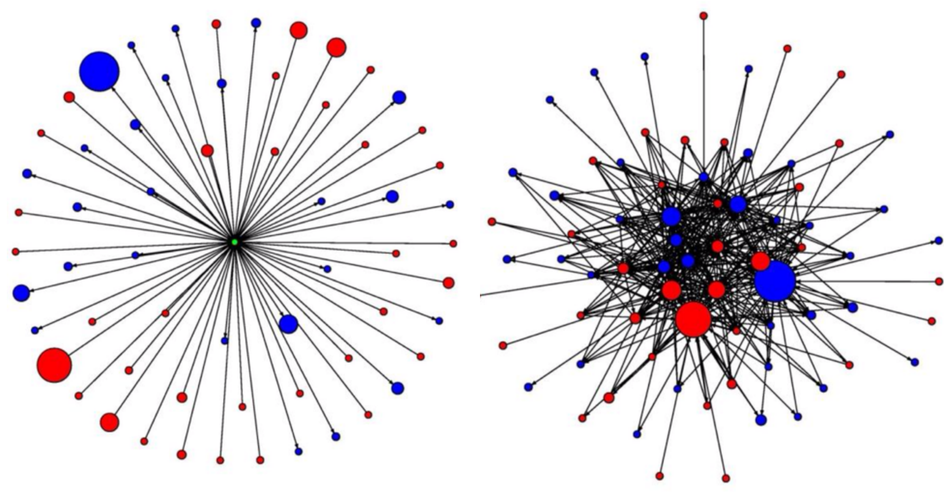
[7] Acemoglu, Daron and Osuman Ozdaglar, Alireza Tahbaz-Salehi. "Systemic Risk and Stability in Financial Networks" NBER Working Paper, *2013*

Research Questions

- How does systemic risk build up in the financial system?
- Can systemic risk be characterized using an agent based model?
- How does insurance impact financial system stability?
- What regulatory policies mitigate build up of systemic risk?

Motivation

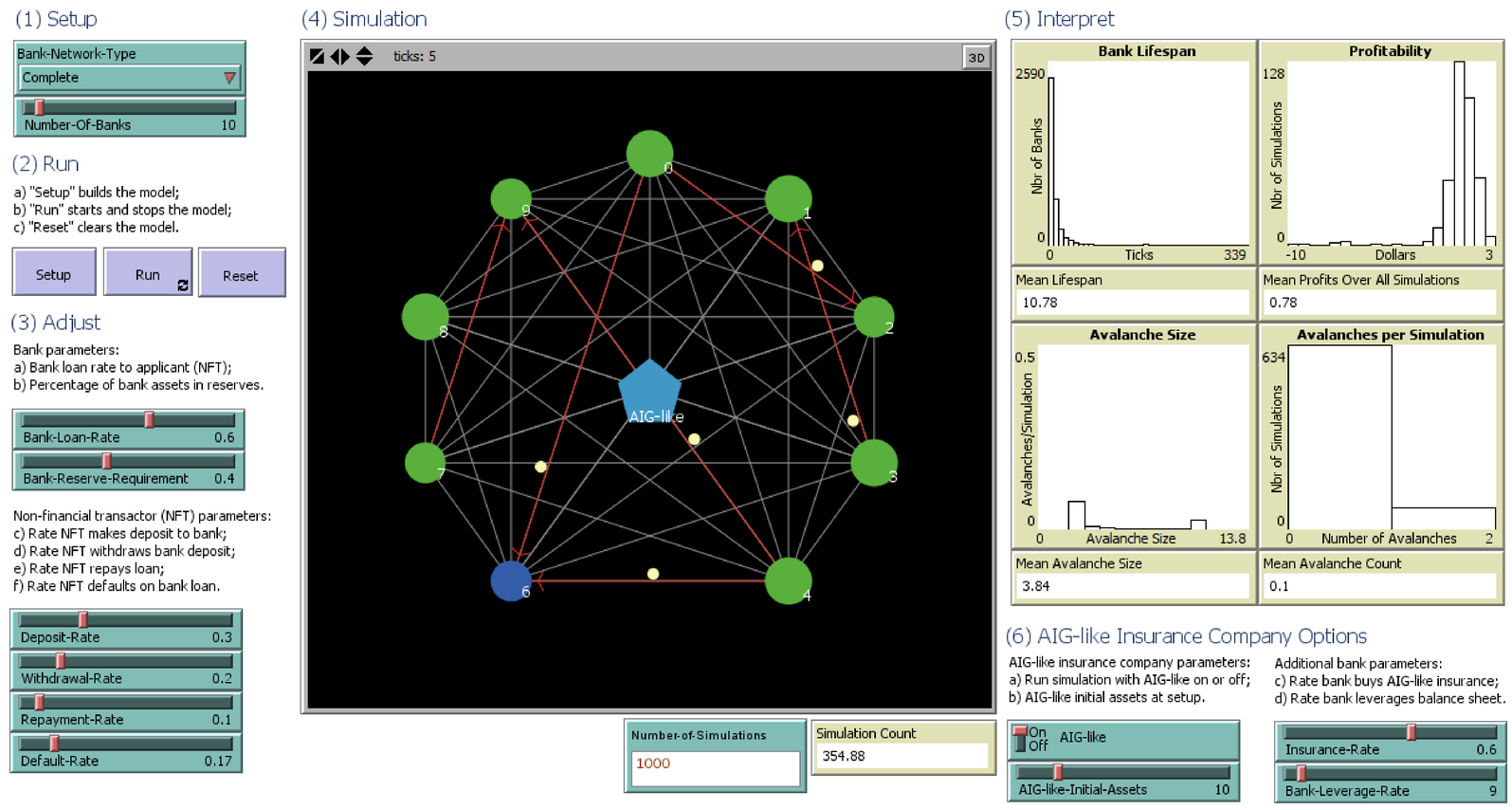
- Efficient banking system facilitates economic transactions.
- Complex links in financial markets are the hallmark of modern finance.
- Bank runs occur when rational agents expect bank failure.
- Insurance on mortgages and bank failures traded in financial system.
- Interconnectedness of institutions, high indebtedness, and contagion explain the global impact of the financial crisis in the United States.



NetLogo Simulation

NetLogo is an agent based model (ABM) software developed at Northwestern University.

Bank Avalanche Model of Systemic Risk in NetLogo:



Research Objectives

- Compare financial stability of various bank networks.
- Examine increases in likelihood of firesale and bank avalanche.
- Compare networks with and without insurance company.
- Test effectiveness of various regulatory measures.